

**REMARKS**

Applicants concurrently file herewith an Excess Claim Fee Payment Letter for three (3) excess independent claims and four (4) total claims, a Petition for Extension of Time for a one-month extension of time, and corresponding extension of time and excess claim fees.

Claims 1-24 are all the claims presently pending in the application. Claims 1, 3-5, 7 and 8 have been amended to more particularly define the claimed invention. Claims 2 and 6 have been amended into independent form. Claims 9-24 have been added to claim additional features of the invention and to provide more varied protection for the claimed invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Applicants appreciate the Examiner's indication that claims 2 and 6 would be allowable if rewritten in independent form. Applicant submits, however, that all of claims 1-24 are allowable.

Claim 1 stands rejected under 35 U.S.C. §102(b) as being anticipated by Watanabe et al. (U.S. Patent Application Publication No. 2002/0174542; hereinafter "Watanabe"). Claim 5 stands rejected under 35 U.S.C. §102(b) as being anticipated by Nakamura et al. (U.S. Patent No. 6,945,632; hereinafter "Nakamura"). Claim 2 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Watanabe in view of Goto et al. (U.S. Patent Application Publication No. 2003/0067525; hereinafter "Goto"). Claim 3 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Watanabe in view of Irie et al. (U.S. Patent Application Publication No. 2002/0180843; hereinafter "Irie"). Claim 7 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Irie. Claim 8

stands rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Goto.

These rejections are respectfully traversed in the following discussion.

## I. THE CLAIMED INVENTION

The claimed invention (e.g., as exemplarily defined in claim 1) is directed to an ink jet head including a chamber plate having a plurality of pressurizing chambers formed therein for storing an ink, a vibrating plate bonded to the chamber plate, a housing having an ink flow path through which an ink is supplied into the pressuring chambers, an orifice through which an ink is ejected from the pressuring chambers, and a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, where the longitudinal vibration mode piezoelectric element is connected to a structure other than the chamber plate. A thickness of the vibrating plate is from 5  $\mu\text{m}$  to 10  $\mu\text{m}$ .

Conventional ink jet heads use a piezoelectric element, which undergoes deflection, for deforming a vibration plate of an ink chamber. However, deflection-type deformation is disadvantageous in that when the area of the piezoelectric element decreases with the increase of the density of the ink chamber, the resulting lack of deflection restricts the driving conditions for the ejection of droplets of ink.

The claimed invention of exemplary claim 1, on the other hand, provides an ink jet head including a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, where the longitudinal vibration mode piezoelectric element is connected to a structure other than the chamber plate (e.g., see Application at page 4, lines 10-22). This feature is important for providing an ink jet head

having a high reliability, which allows efficient deformation of the vibrating plate even if the vibrating plate has a high density (see Application at page 4, lines 5-9).

Furthermore, since the piezoelectric element of the conventional device itself is not supported on a structure, the deflection of the piezoelectric element with respect to a high viscosity solution is limited. Especially, when the piezoelectric elements are mounted in high density, it is impossible to eject a high viscosity solution. However, the claimed structure of the longitudinal vibration mode piezoelectric element is effective to a solution having a viscosity of 5mPas or more (see Application at page 2, line 21 though page 3, line 10).

## **II. THE PRIOR ART REFERENCES**

### **A. The Watanabe Reference**

The Examiner alleges that Watanabe teaches the claimed invention of claim 1. Applicants submit, however, that there are features of the claimed invention that are neither taught nor suggested by Watanabe.

That is, Watanabe does not teach or suggest “*a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, the longitudinal vibration mode piezoelectric element being connected to a structure other than the chamber plate*”, as recited in claim 1.

The Examiner attempts to rely on Figures 1 and 2, and paragraphs [0053]-[0055] and [0057] of Watanabe to support his allegations. The Examiner, however, is clearly incorrect.

Indeed, nowhere in these figures nor these passages (nor anywhere else for that matter) does Watanabe teach or suggest a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, where the

longitudinal vibration mode piezoelectric element is connected to a structure other than the chamber plate. Indeed, Watanabe teaches a bimetal element.

That is, Watanabe teaches that a piezoelectric element is applied a voltage through the vibration plate. A portion of the vibration plate corresponding to the pressure chamber deforms causing ink to be emitted from an emission opening. When a pulse-like voltage is applied, the piezoelectric element shrinks in the crosswise direction. Thus, the portion of the vibration plate corresponding to the piezoelectric element is deflected and deformed by the bimetal effect (see Watanabe at paragraph [0054]).

In stark contrast, the claimed invention may include a longitudinal vibration mode piezoelectric element. The Application discloses that when the vibration plate is deformed using a deflection mode piezoelectric element as represented by a bimetal system, as in Watanabe, the effect on the adjacent ink chambers is small because the individual piezoelectric elements are separated from each other (e.g., see Application at page 8, lines 7-11).

In stark contrast, in the case of a longitudinal vibration mode involving the direct use of expansion and contraction of the piezoelectric element for the deformation of the vibration plate, as recited in the claimed invention, the effect of deforming the ink chamber is great (e.g., see Application at page 8, lines 12-15). This feature is not recognized by Watanabe.

Moreover, Watanabe does not teach or suggest “*wherein a thickness of the vibrating plate is from 5 $\mu$ m to 10 $\mu$ m*”, as recited in claim 1.

Indeed, Watanabe merely teaches an overlapping thickness range of 1 $\mu$ m to 7 $\mu$ m. Applicants point out that “in order to anticipate the claims, the claimed subject matter must be disclosed in the reference with “sufficient specificity to constitute an anticipation under the statute” (see M.P.E.P. § 2131.03). For instance, if the reference teaches an overlapping range, but there is unexpected results within the claimed range, it may be reasonable to

conclude that the overlapping range of the reference does not disclose the claimed range with “sufficient specificity”.

The Application discloses that the thickness of the vibration must be at least 5  $\mu\text{m}$ , because it is likely that minute holes can be generated during etching with nitric acid (see Application at page 11, lines 8-11). This feature is not recognized by Watanabe.

Therefore, Applicants submit that there are features of the claimed invention that are not taught or suggested by the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

### **B. The Nakamura Reference**

The Examiner alleges that Nakamura teaches the claimed invention of claim 5. Applicants submit, however, that there are features of the claimed invention that are neither taught nor suggested by Nakamura.

That is, Nakamura does not teach or suggest “*a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, the longitudinal vibration mode piezoelectric element being connected to a structure other than the chamber plate*”, as recited in claim 5.

The Examiner attempts to rely on Figures 3-11, and column 10, lines 53-67 of Nakamura to support his allegations. The Examiner, however, is clearly incorrect.

Indeed, nowhere in these figures nor this passage (nor anywhere else for that matter) does Nakamura teach or suggest a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, where the longitudinal vibration mode piezoelectric element is connected to a structure other than the chamber plate. Indeed, Nakamura does not even mention a longitudinal vibration mode piezoelectric element.

That is, Nakamura merely teaches a piezoelectric element (see Nakamura at column 10, lines 53-67). Nowhere, however, does Nakamura provide any support for the Examiner's allegation that the piezoelectric element is a longitudinal vibration mode piezoelectric element.

In stark contrast, the claimed invention may include a longitudinal vibration mode piezoelectric element. The Application discloses that in the case of a longitudinal vibration mode involving the direct use of expansion and contraction of the piezoelectric element for the deformation of the vibration plate, as recited in the claimed invention, the effect of deforming the ink chamber is great (e.g., see Application at page 8, lines 12-15). This feature is not recognized by Nakamura.

Therefore, Applicants submit that there are features of the claimed invention that are not taught or suggested by the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

### **C. The Goto Reference**

The Examiner alleges that Goto would have been combined with Watanabe to teach the claimed invention of claim 2. Furthermore, the Examiner alleges that Goto would have been combined with Nakamura to teach the claimed invention of claim 8. Applicants submit, however, that, even if combined, the Examiner's alleged combination of references would not teach or suggest (nor make obvious) each and every feature of the claimed invention.

As a preliminary matter, Applicants point out that the Examiner's rejection of claim 2 should be directed to claim 4. That is, the limitation "wherein a solution having a viscosity of from 5 to 25 mPas is ejected", which the Examiner addresses in his rejection of claim 2 (see Office Action dated February 21, 2006 at page 4) is actually recited in dependent claim 4.

Furthermore, the Examiner has indicated that claim 2 would be allowable if rewritten in independent form. Appropriate correction is requested.

Applicants submit that, neither Goto nor Watanabe nor Nakamura, nor any combination thereof, teaches or suggests “*a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, the longitudinal vibration mode piezoelectric element being connected to a structure other than the chamber plate*”, as recited in claim 1, and similarly recited in claim 5.

Indeed, as detailed in sections A and B, above, neither Watanabe nor Nakamura teaches or suggests this feature. Furthermore, Applicants submit that Goto does not make up the deficiencies of Watanabe and Nakamura.

Indeed, nowhere does Goto teach or suggest a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, where the longitudinal vibration mode piezoelectric element is connected to a structure other than the chamber plate. The Examiner does not even allege that Goto teaches or suggests this feature. The Examiner merely alleges that Goto teaches that it is known to provide a solution having a viscosity from 5 to 25 mPa.s.

Thus, Goto fails to make up the deficiencies of Watanabe and Nakamura.

Therefore, Applicants submit that, even if combined, the alleged combination of references would not teach or suggest (nor make obvious) each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

#### **D. The Irie Reference**

The Examiner alleges that Irie would have been combined with Watanabe to teach the

claimed invention of claim 3. Furthermore, the Examiner alleges that Irie would have been combined with Nakamura to teach the claimed invention of claim 7. Applicants submit, however, that, even if combined, the Examiner's alleged combination of references would not teach or suggest (nor make obvious) each and every feature of the claimed invention.

That is, neither Irie nor Watanabe nor Nakamura, nor any combination thereof, teaches or suggests "*a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, the longitudinal vibration mode piezoelectric element being connected to a structure other than the chamber plate*", as recited in claim 1, and similarly recited in claim 5.

Indeed, as detailed in sections A and B, above, neither Watanabe nor Nakamura teaches or suggests this feature. Furthermore, Applicants submit that Irie does not make up the deficiencies of Watanabe and Nakamura.

The Examiner attempts to rely on Irie as teaching that it is known to use a metal vibration plate in an ink jet head. The Examiner attempts to rely on paragraph [0184] of Irie to support his allegations.

However, nowhere does Irie teach or suggest a longitudinal vibration mode piezoelectric element for generating pressure under which an ink droplet is ejected through the orifice, where the longitudinal vibration mode piezoelectric element is connected to a structure other than the chamber plate. Indeed, the Examiner does not even allege that Irie teaches or suggests this feature. The Examiner merely alleges, as indicated above, that Irie teaches that it is known to use a metal vibration plate in an ink jet head.

Thus, Irie fails to make up the deficiencies of Watanabe and Nakamura.

Therefore, Applicants submit that, even if combined, the alleged combination of references would not teach or suggest (nor make obvious) each and every feature of the



claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejection.

### **III. NEW CLAIMS**

New claims 9-24 have been added to provide more varied protection for the claimed invention and to claim additional features of the invention. These claims are independently patentable because of the novel features recited therein.

Applicant submits that new claims 9-24 are patentable over any combination of the applied references at least for analogous reasons to those set forth above with respect to claims 1-8.

### **IV. FORMAL MATTERS AND CONCLUSION**

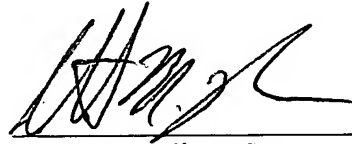
In view of the foregoing, Applicant submits that claims 1-24, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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